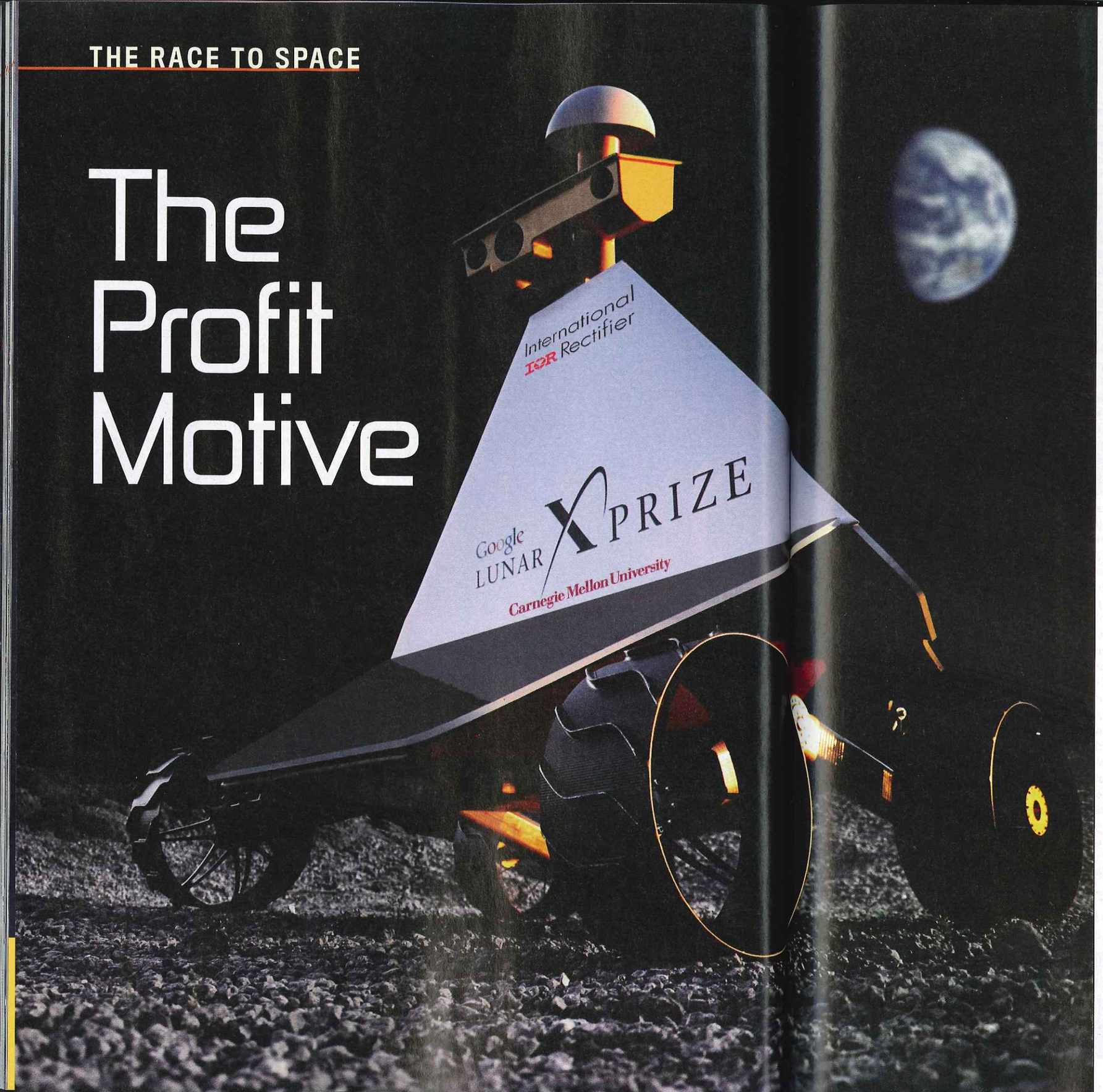
The Profit Motive



ENTREPRENEURS ARE LINING UP FOR LIFTOFF AND ARE HOPING TO CASH IN BIG

Three small rolling robots, operated remotely, comb the pitted lunar surface. They home in on mineralogical hot spots—stores of platinum and rare-earth elements such as titanium—to take samples of soil that will later be excavated with larger digging vehicles. Robotic "tugs" will then ferry the cosmic bounty back to Earth, the rocket equivalent of railroads that connected settlements in the days of the gold rush.

So goes the business plan of Moon Express, a start-up in Mountain View, Calif. The company is designing a lunar landing vehicle in collaboration with NASA that it plans to send to the moon within two years. In the process, it hopes to win a $20 million prize and take a prominent spot on a burgeoning list of space-related businesses. "When we land on the moon, we will change people's minds of what is possible," promises Bob Richards, the company's CEO and cofounder with Internet entrepreneurs Naveen Jain and Barney Pell.

While the U.S. space program has been forced to scale back its missions in recent years due to budget cuts, entrepreneurs stand poised to step into the void with big dreams and deep pockets. Advances in space payload and transportation technology have made it easier than ever for private companies to send cargo into space, from communications satellites to cremated remains. (You can purchase a final send-off for about $10,000 from Celestis, a division of Space Services, an aerospace company based in Houston.) "Rocket science is no longer 'rocket science,'" says William Watson, executive director of the Space Frontier Foundation. "It can almost be achieved by a team of garage engineers." Space-related firms generated revenues of almost $280 billion in 2010. And the sector promises to make commercial space travel a reality in the next few years while aiming for other lofty goals like generating solar energy from space via large orbiting satellites, mining the moon and asteroids, and establishing colonies of people on the moon or planets (story, Page 56).

Perhaps no one has done more to inspire the public's space dreams than Richard Branson,

A prototype of a lunar rover by Carnegie Mellon spinoff Astrobiotic Technology

COURTESY OF ASTROBIOTIC TECHNOLOGY

whose latest venture, Virgin Galactic, is almost sure to be the world's first commercial space line. With his typical flare, Branson dedicated the company's new terminal at Spaceport America in New Mexico last October by rappelling from its roof while swigging champagne and mugging for the cameras. Wealthy Internet and computer software entrepreneurs—dubbed "thrillionaires"—are also fueling the movement. Take Elon Musk, 40, cofounder of PayPal and founder of Tesla Motors, the sports car company whose sleek vehicles run exclusively on electricity. SpaceX, the company he founded in 2002, is preparing to deliver cargo to the International Space Station, the first time a private company has played such a role. It plans its first test flight in spring 2012. Amazon's founder, Jeff Bezos, has revealed little about his enterprise, Blue Origin, launched in 2000 to develop space vehicles. But the company has a contract with NASA to begin testing its spacecraft, called New Shepard, which will be used for government and civilian purposes.

Awake at home in San Francisco, shop in Adelaide, LUNCH IN TOKYO, and get back in a day.

Microsoft cofounder Paul Allen is getting into the act, too. In 2004, Allen backed the first privately built and flown spacecraft, SpaceShipOne, developed by famed aerospace engineer Burt Rutan. (Five of Rutan's aircraft reside in the Smithsonian's National Air and Space Museum.) Allen has now invested millions in the pair's new company, Stratolaunch Systems, which has developed a system for launching spacecraft into orbit from a high-altitude jet, using less fuel than a ground launch. "Silicon Valley engineers grew up on a diet of sci-fi and the Apollo program," says Tiffany Montague, who heads up space initiatives for technology giant Google, which has been turning an entrepreneurial eye toward the cosmos. "We're all space geeks at heart."

Whether all these new ventures will make money is another question. Many of the new companies "have iconic wealthy founders," Watson cautions, "so their progress is far more related to these individuals' financial health and dedication than to that of sales." But some are boosting their bottom line in other ways, securing lucrative contracts with NASA, for example, or through early ticket sales. Within the next year or two, Virgin Galactic expects to start taking customers on trips just beyond the Earth's atmosphere, where they will experience about six minutes of weightlessness, for $200,000. These jaunts will take a little over two hours. The company has already sold nearly 500 tickets. Eventually, it plans to offer suborbital space flights between continents at a fraction of the time commercial air travel requires. You could awake at home in San Francisco, shop in Adelaide, have lunch in Tokyo, and get back home for dinner in the same day.

Space taxis. Other companies are in line to replace NASA's shuttle program, transporting people and payloads to and from the International Space Station. So far, NASA has awarded nearly $2 billion to SpaceX and just over $2 billion to the firm Orbital Sciences to resupply the space station, which NASA shares with the space agencies of Europe, Canada, Japan, and Russia. Next up for SpaceX: taxiing astronauts to and from the space station, so that they don't have to hitch a ride with the Russians.

Such arrangements offer NASA a significantly less costly way of doing business. Last year, an agency study found that SpaceX spent about $443 million to develop its Falcon 9 launch vehicle. If NASA had tried to do the same work, its cumbersome bureaucracy and reliance on subcontractors would have sent the price tag ballooning to nearly $1.4 billion, the study estimated.

Interest in privately led initiatives was galvanized in 2004, when Allen's and Rutan's SpaceShipOne won the coveted $10 million Ansari X Prize by making two successful flights in two weeks. (The X Prize Foundation recruits wealthy individuals to back awards for game-changing achievements in space and other industries to promote innovation.) "The X Prize woke many young people up to the realization that we don't have to wait for NASA to decide on our next human space mission," Watson says. Many graduates from top universities, excited by the promise of space, decided to stick with aerospace engineering, instead of potentially more lucrative fields like nanotechnology or biotechnology. "Companies like SpaceX," he notes, are "reaping the brain-power benefits."

DID YOU KNOW...

Journalist Toyohiro Akiyama of Japan, the first space "tourist," went to the Mir space station for his network in 1990. Cost: some $12 million.

Google is now funding the latest space-related X Prize, which will be given to the first teams to land on the moon since the Apollo missions of the 1960s and '70s. The Google Lunar X Prize was announced in 2007, and the 26 competing teams have until the end of 2015 to land a robot on the moon, move it 500 meters on the lunar surface, and send data and images back to Earth. The first team to achieve the goal pockets $20 million; the second to succeed gets $5 million.

The space sector is growing so large that many firms are springing up to provide supporting products and services, from spacesuits to space habitats. Bigelow Aerospace in Las Vegas is developing "turnkey" space stations that will be leased for months at a time to companies, scientists, universities, and even governments that want a presence in space but can't afford to build facilities themselves. The units can accommodate about six people, though they are being designed as modules that can be attached together for larger groups. Fittingly, the company was founded by Robert Bigelow, who made his fortune creating Budget Suites of America, a chain of extended-stay hotels. Two of the company's unmanned prototypes, Genesis I and II, were launched into space aboard a Russian rocket in 2006 and 2007, respectively, and continue to orbit the Earth. Armed with computers, cameras, and other scientific equipment, they are testing materials and systems to help determine the habitats' long-term viability.

Research bonanza. The opportunity to find low-cost ways to conduct experiments in space is generating yet another cottage industry. NanoRacks, started in 2009, leases compartments for small research payloads on its hardware on the space station, allowing universities, small organizations, and even individuals to conduct research in weightless conditions at a relatively cheap $30,000 to $60,000. Customers design the self-contained experiments to fit in 4-inch cube-shaped kits that can be attached to the station's power source. Technological standardization and software advances have made the research model so simple that astronauts on the space station need only plug in a USB cord to start the process. "We're the ultimate plug and play," says Jeffrey Manber, the company's managing director. Experiments have ranged from gauging insect behavior to growing protein crystals found in certain diseases to decipher their atomic structure. Protein crystals grow much larger and in a more regular pattern in space than on Earth, making it easier for researchers to take the first steps in creating new drugs to treat the diseases.

In research conducted on the space station, the biotech space firm Astrogenetix has shown that microbes responsible for common infections, including salmonella and methicillin-resistant Staphylococcus aureus, become more virulent in space. That has allowed the company to isolate the genes in both bacteria that cause the infections to spread and to begin work on possible vaccines.

Whether it's developing new drugs or finding natural resources, proponents of business in space see limitless potential. And they believe there's much for humanity—and stockholders—to gain from opening up the final frontier to a free market. Says Manber: "We're showing policymakers and the public that capitalism can thrive in space." ●

By Beth Howard

Richard Branson's Virgin Galactic will one day transport tourists to space.

STEFANO PALTERA—AP